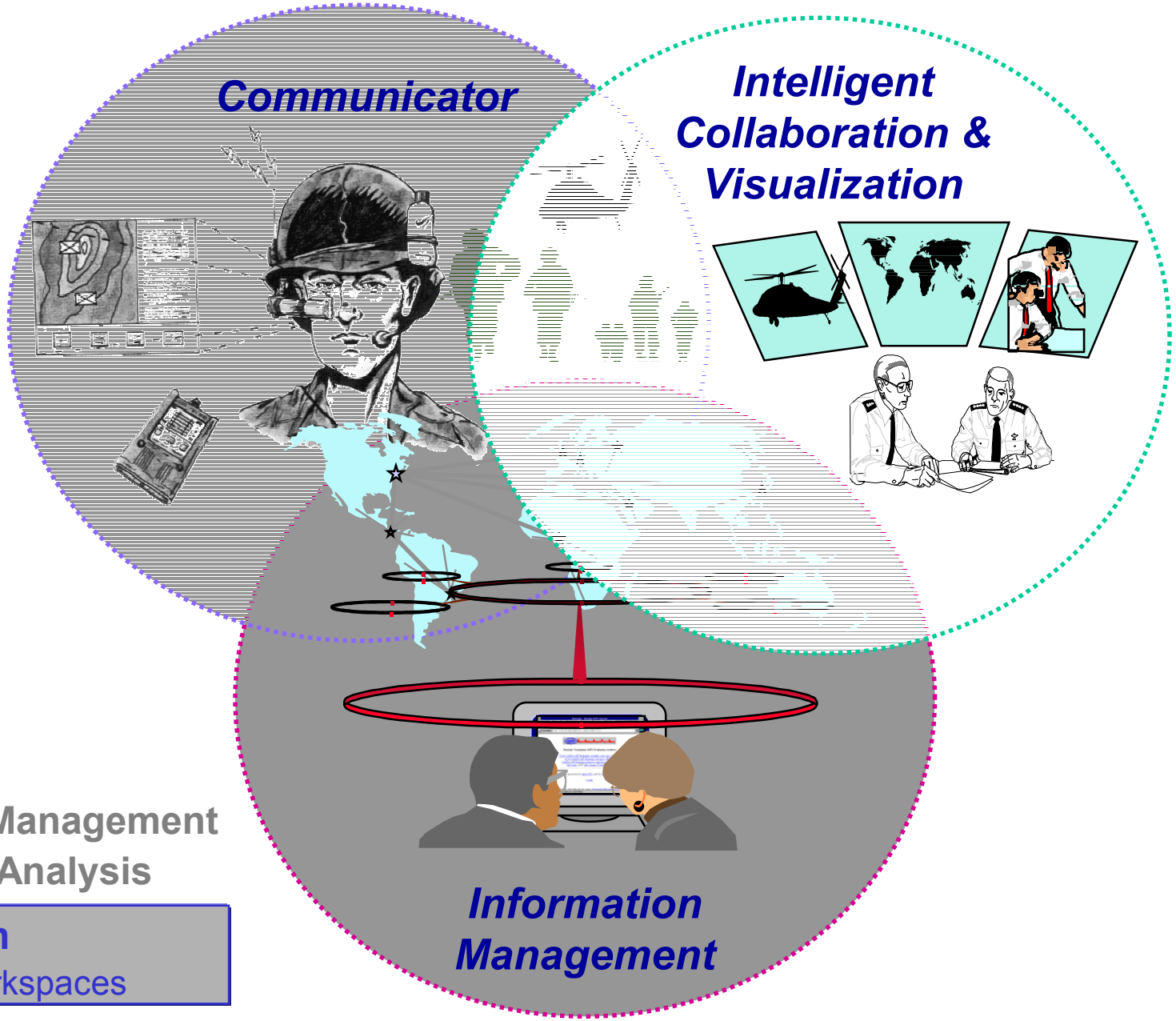


- Information Management
  - Situation Analysis
- **Collaboration**
  - Shared Workspaces
- Communicator
  - Dialogue

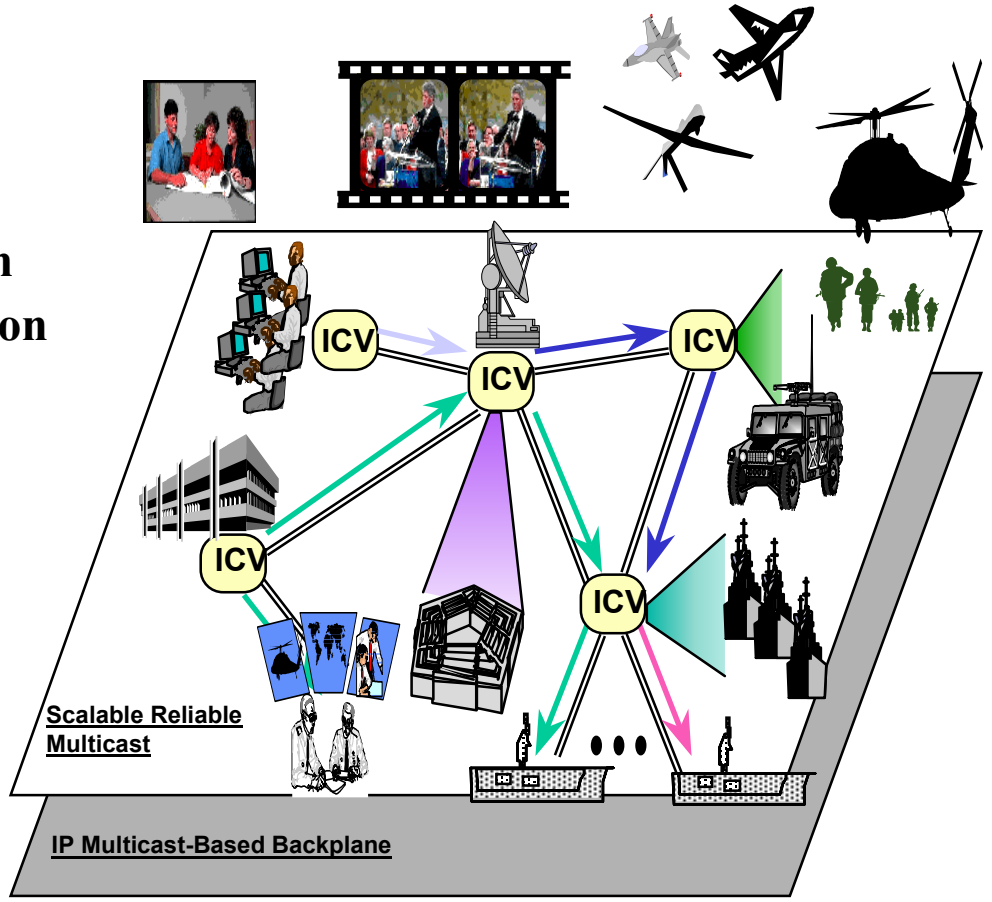
Software that organizes teams in rapidly changing environments

Team-based Software

- Link Visual Workspaces
- Enable Multi-modal Collaboration
- Enable Asynchronous Collaboration

Connect Collaborators/Information

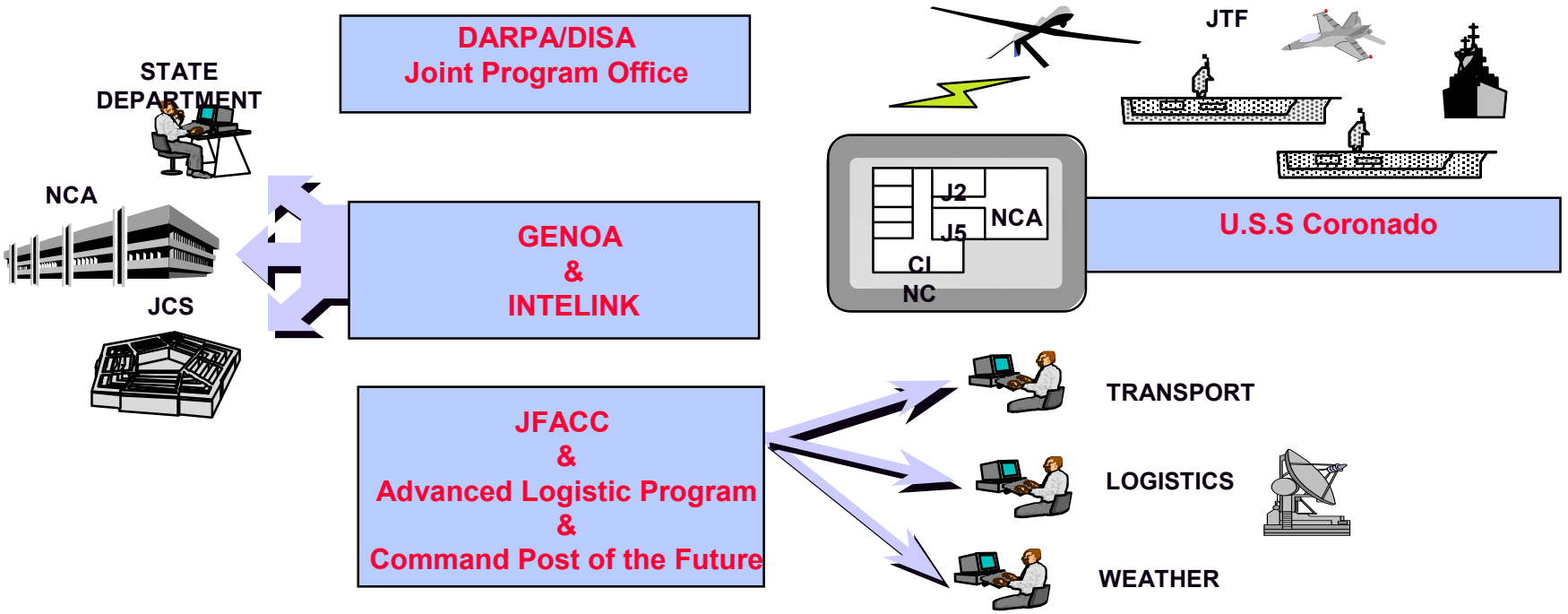
- Discover Relevant Collaborators
- Discover Relevant Information
- Connect the Dots



Emphasize Technology Transfer

MILITARY TARGETS

SPAWAR Demonstration May 13-15, 1998



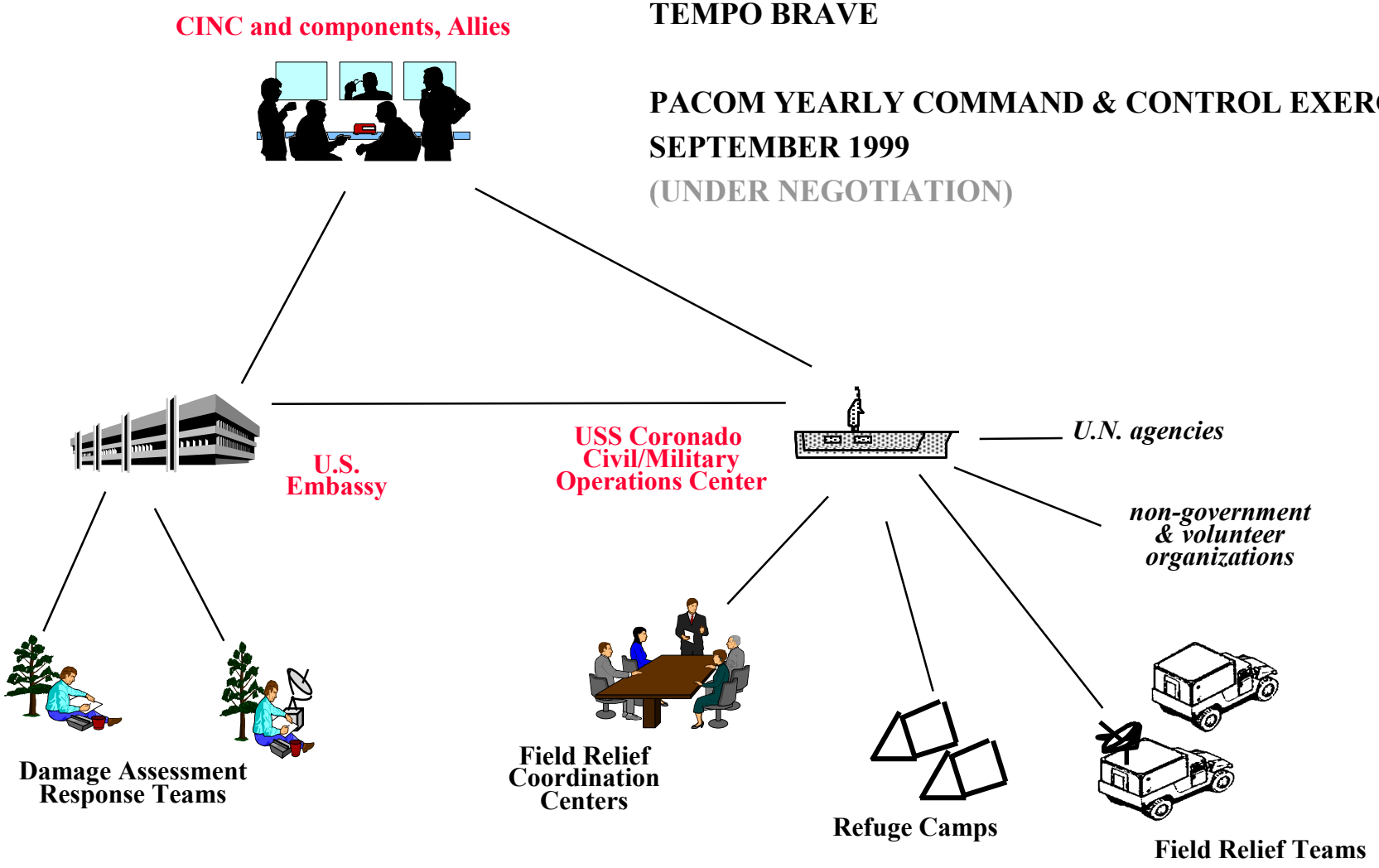
COMMERCIAL TARGETS (working through International Data Corporation)

Major Players		Startup Companies
	Microsoft Netscape IBM Lotus Novell Oracle	Placeware Open Text Instinctive Radnet Precept

Capstone Demonstration
Pacific Command Disaster Relief Scenario

TEMPO BRAVE

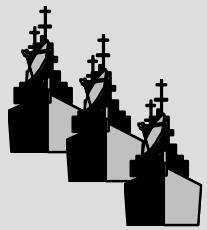
PACOM YEARLY COMMAND & CONTROL EXERCISE
SEPTEMBER 1999
(UNDER NEGOTIATION)



Intelligent Collaboration and Visualization

Team-based Software

- Link Visual Workspaces
- Enable Multi-modal Collaboration
- Enable Asynchronous Collaboration



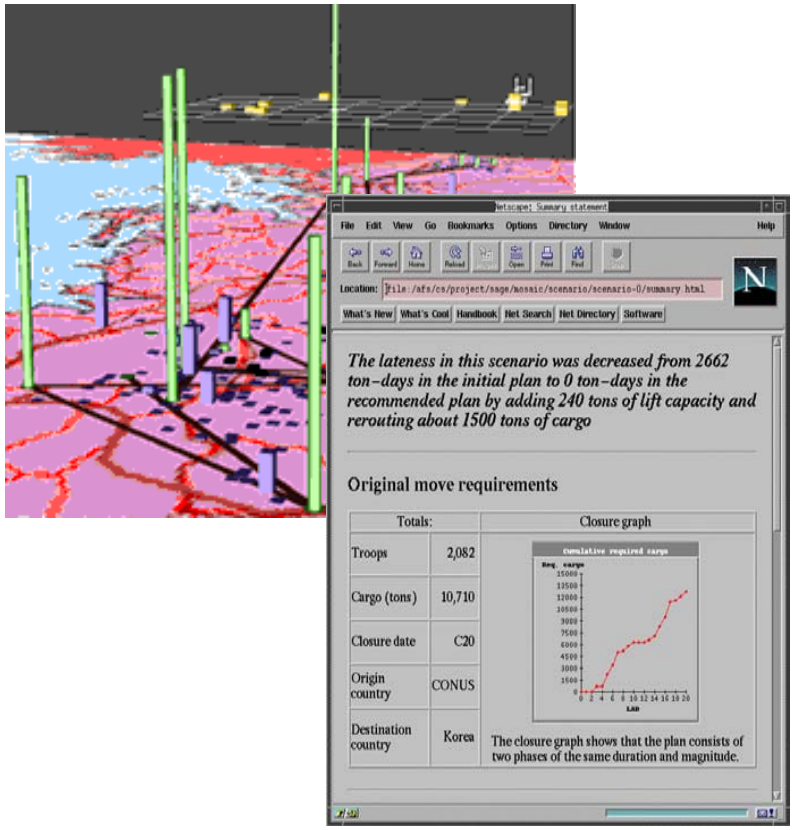
Connect Collaborators/Information

- Discover Relevant Collaborators
- Discover Relevant Information
- Connect the Dots

Link Visual Workspaces

Team-based Software
- Link Visual Workspaces
- Multi-modal Collaboration
- Asynchronous Collaboration

VISAGE



Provide collaborators the best representation to visually explore, analyze, and explain data

- knowledge-based rules for generating 2-D/3-D graphics
- methods to automatically generate text explanations coordinated with graphics
- distributed, linked visual workspaces

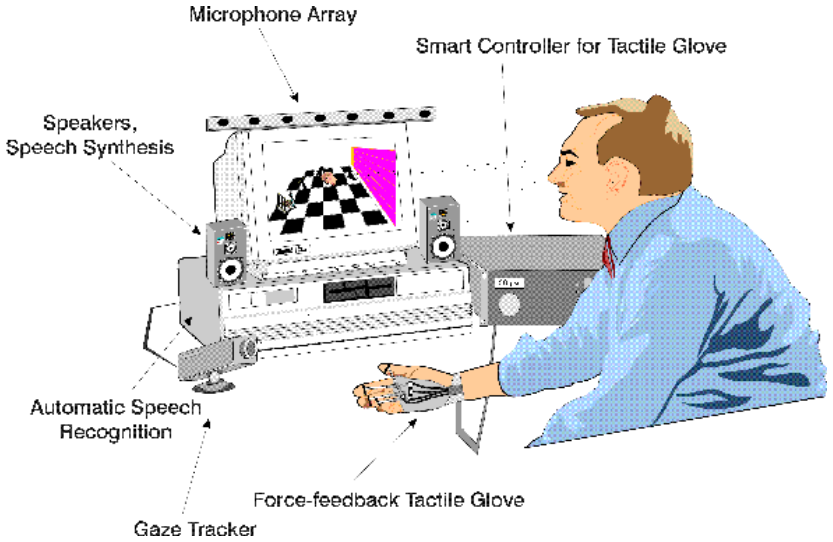
Evaluation Plans

Exercise in ALP, JFACC, Genoa, and DMIF

Carnegie Mellon University, University of Pittsburgh, and MAYA Design

Multi-modal Collaboration

Team-based Software
- Link Visual Workspaces
- Multi-modal Collaboration
- Asynchronous Collaboration



Rutgers University

Innovative user interfaces specifically designed for collaboration in multimedia environments

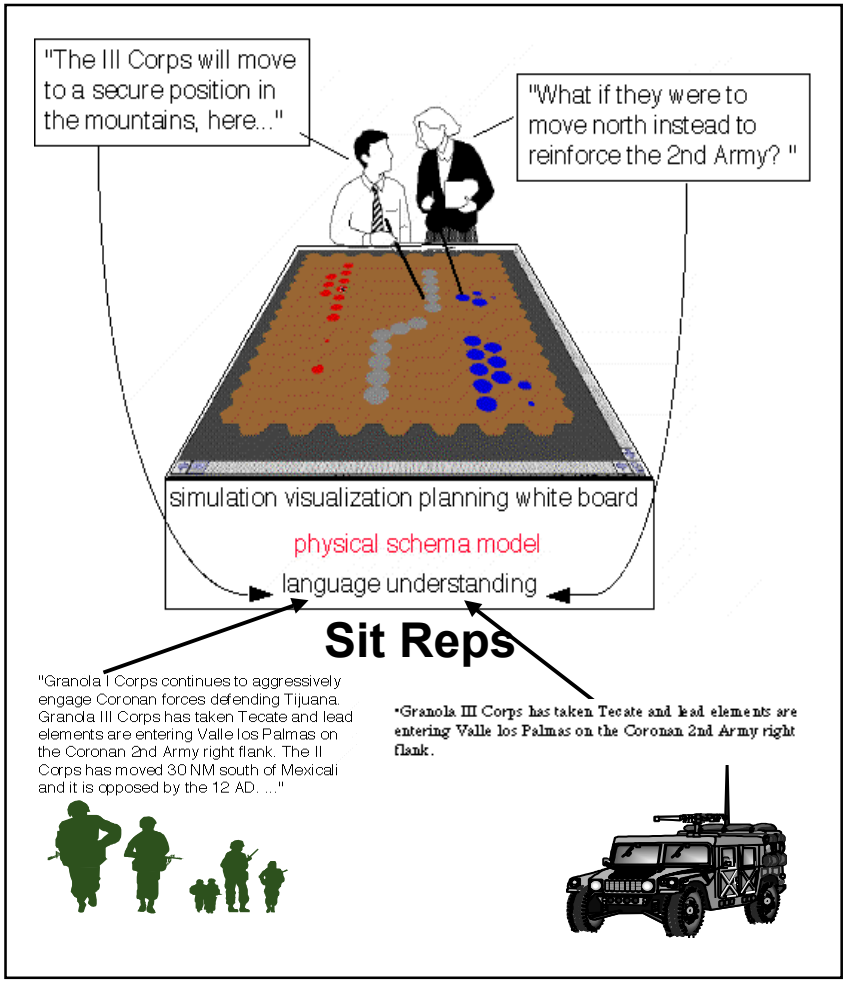
- graphic object extraction techniques
- unencumbered speech-recognition
- language understanding
- gaze and gesture tracking
- speech synthesis

Evaluation Plans

Working with CECOM and BA&H, apply the Rutgers' multi-modal interface to a distributed command and control application

Asynchronous Collaboration

Team-based Software
- Link Visual Workspaces
- Multi-modal Collaboration
- Asynchronous Collaboration



Bridge gaps in time and medium between collaborators

- natural language understanding
- physical schemas for knowledge representation
- unsupervised learning of physical schemas
- visual animation of physical schemas

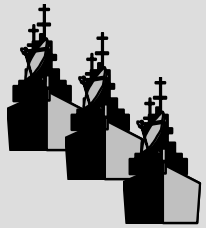
Evaluation Plans

Working with JFACC program to apply techniques to air campaign planning, monitoring, and re-planning

Intelligent Collaboration and Visualization

Team-based Software

- Link Visual Workspaces
- Enable Multi-modal Collaboration
- Enable Asynchronous Collaboration

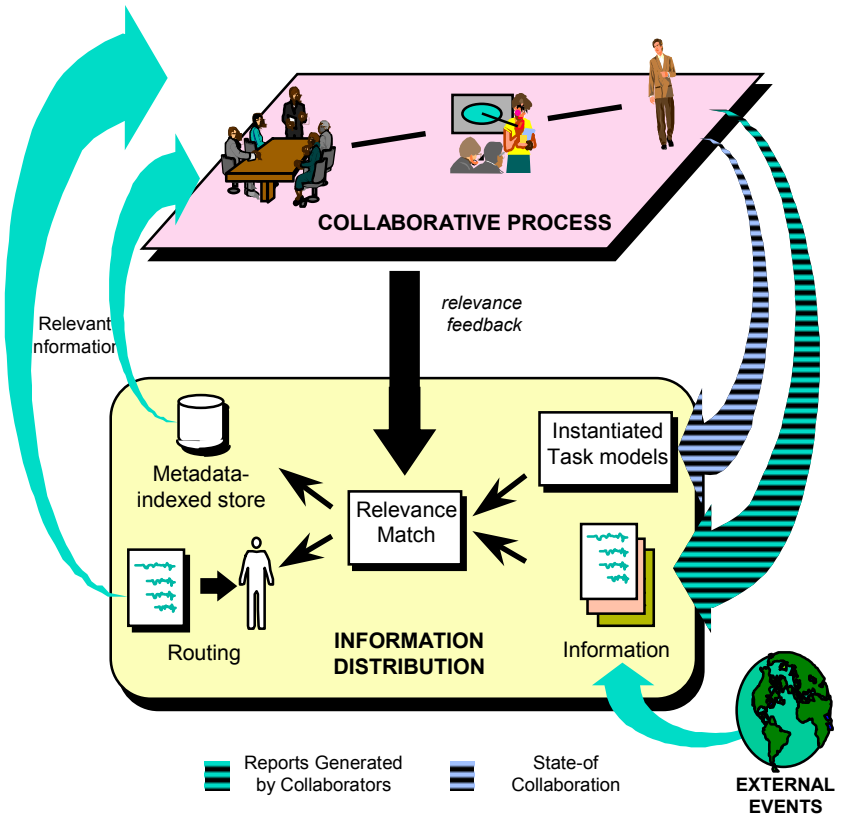


Connect Collaborators/Information

- **Discover Relevant Collaborators**
- **Discover Relevant Information**
- **Connect the Dots**

Discover Relevant Collaborators

Connect Collaborators/Information
- Discover Relevant Collaborators
- Discover Relevant Information
- Connect the Dots



Enable potential collaborators to discover one another in real-time during a task

- graph-matching/virtual scents
- task modeling and representation
- probabilistic pattern-matching algorithms
- relevance feedback

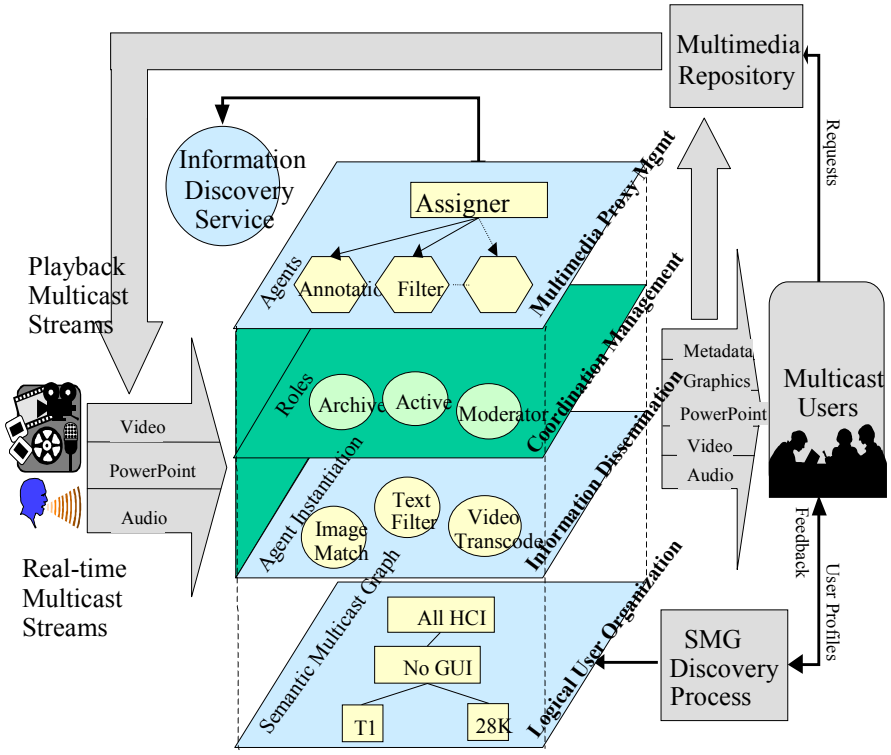
Evaluation Plans

Experimental deployment at SPAWAR Systems Center and in Genoa and JFACC

SRI International and HRL Laboratories

Discover Relevant Information

Connect Collaborators/Information
- Discover Relevant Collaborators
- Discover Relevant Information
- Connect the Dots



HRL Laboratories, UCLA, and University of Chicago

Extract content tags from multi-media data and distribute them to collaborators -- in real-time

- event bus sniffing
- video scene change detection
- audio transcription
- topic spotting and entity identification
- adaptive fuzzy filters

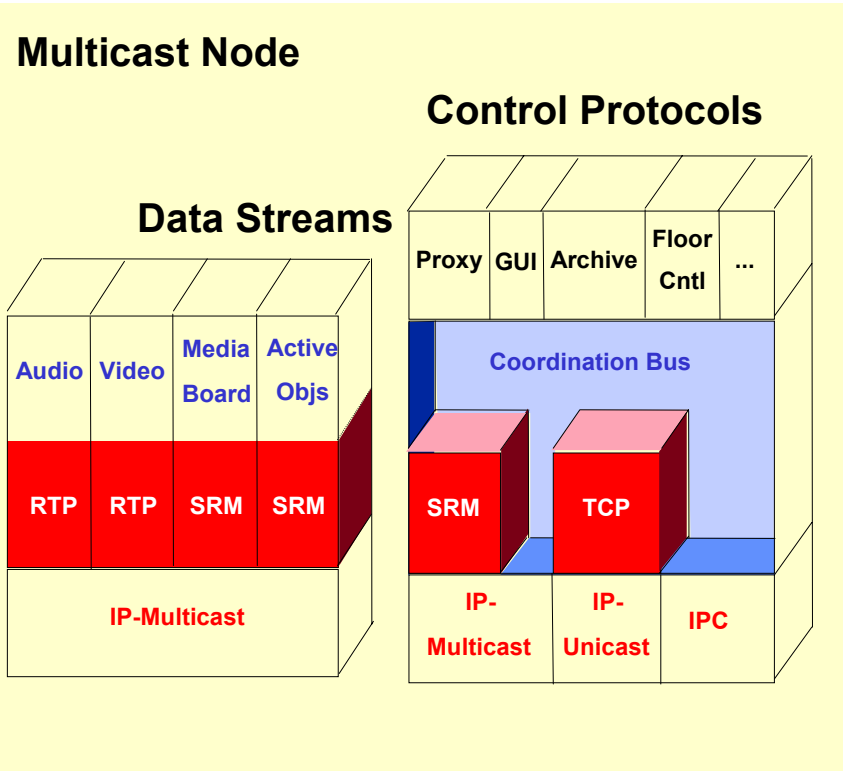
Evaluation Plans

Experimental deployment on the Internet and with Direct Satellite Service set-top boxes

Possible application in the BADD and GBS programs

Connect the Dots

Connect Collaborators/Information
- Discover Relevant Collaborators
- Discover Relevant Information
- Connect the Dots



Robust, decentralized, multimedia communication among 100's to 1000's of Internet nodes

- scaleable, reliable multicast
- distributed coordination bus
- distributed multimedia archiving

Evaluation Plans

Public beta release of MASH software - May 98

Experimental use in DARPA VINT project and for courses at UCB - FY 98

Experimental deployment for Internet Engineering Task Force meetings - FY 99

Formal evaluation by NIMA - FY 98

University of California, Berkeley

Connect the Dots

Overcome impedance mismatch in bandwidths and displays among multicast users

- transcoding gateways (video, HTML, mediaboard)
- consensus-based bandwidth adaptation protocol
- programmable network proxy system

Evaluation Plans

Campus-wide use of transcoding video gateway (MEGA) and proxy architecture at UCB from Summer 1997

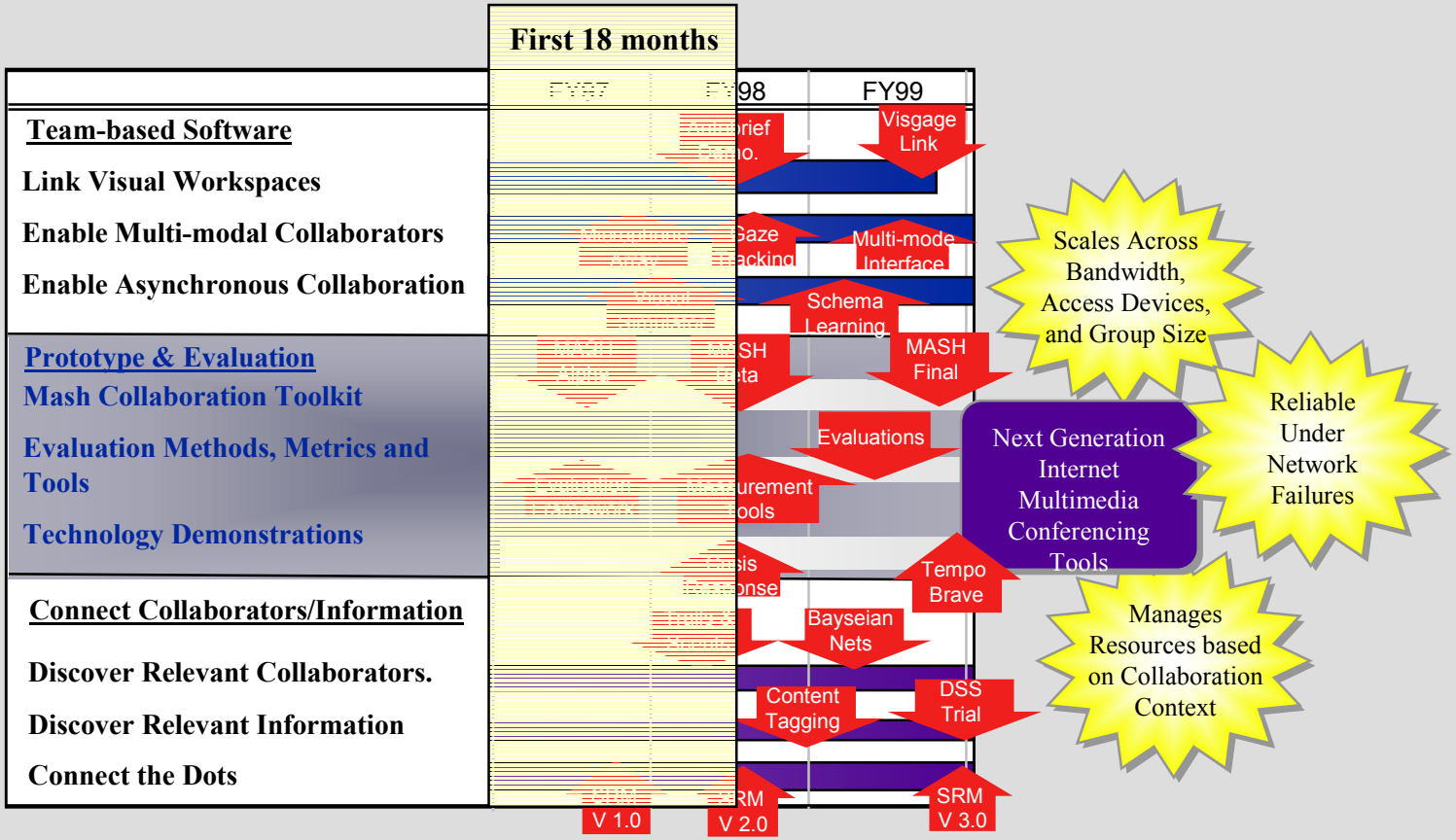
Consensus-based bandwidth adaptation (SCUBA) deployed at UCB in Fall 1997

Transcoder and proxy software adopted by Proxinet for commercial ProxiWeb product

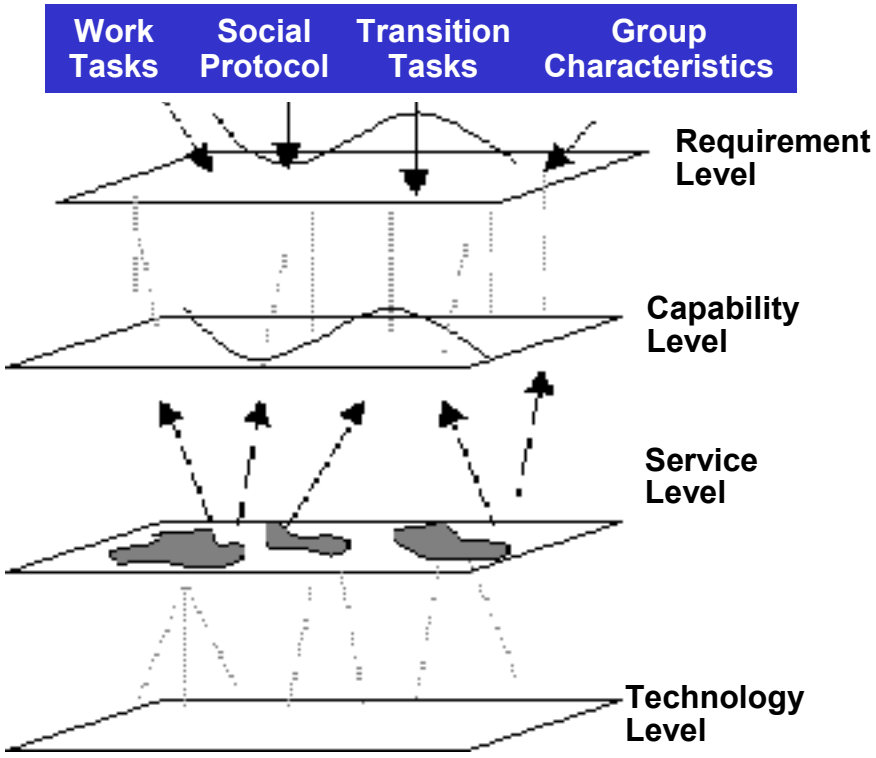
Handheld Top Gun Mediaboard under evaluation for commercial applicability

University of California, Berkeley

Road Map


First 18 months
FY97
FY98
FY99
Team-based Software
Link Visual Workspaces
Enable Multi-modal Collaborators
Enable Asynchronous Collaboration
Prototype & Evaluation
Mash Collaboration Toolkit
Evaluation Methods, Metrics and Tools
Technology Demonstrations
Connect Collaborators/Information
Discover Relevant Collaborators.
Discover Relevant Information
Connect the Dots
Visgage Link
Multi-mode Interface
Schema Learning
MASH Final
Evaluations
Tempo Brave
Bayseian Nets
Content Tagging
DSS Trial
SRM V 1.0
SRM V 2.0
SRM V 3.0
Next Generation Internet Multimedia Conferencing Tools
Scales Across Bandwidth, Access Devices, and Group Size
Reliable Under Network Failures
Manages Resources based on Collaboration Context

Evaluation Approach



Mitre, NIST, and NIMA

Develop method, metrics, and tools to evaluate collaboration technology

- four-level, bi-directional evaluation model
- multi-media logging tools
- distributed collaboration scenario controllers
- standard logging formats

Evaluation Plans

Evaluated existing collaboration software -- Placeware and Collaborative Virtual Workspace -- during FY 97

Evaluate MASH and Habanero during FY 98

Expected Results

Early military adopters derive near-term benefits from specific IC&V technologies, while industry delivers future collaboration technology based on DARPA research and development. Such technology will:

- Link visual workspaces across distributed, heterogeneous systems,
- Enable collaboration among and across interaction modes,
- Discover relevant collaborators and information in real-time, and
- Connect collaborators/information robustly across variations in bandwidth and display technology.

IC&V Accomplishments Since January 1998

- UCB released beta version of MASH with SRM v2.0
- HRL deployed collaborator discovery software and filed for patent
- UIUC released Virtue software v1.0 for immersive data visualization and exploration
- Virtue deployed to visualize large-scale battlefield simulation data from SFExpress
- Mitre released multi-modal logging environment
- IC&V evaluation methodology deployed at NIMA and SPAWAR to evaluate collaboration systems
- Distributed 35,000 copies of Alice 3-D animation authoring software
- Habanero 3-D collaborative visualization tools chosen by Sun/JavaSoft to demonstrate Java 3-D API at the March JavaOne conference
- Held research coalition meeting between IC&V researchers and relevant companies (Microsoft, Novell, Lotus, Radnet, and OpenText)